Appendix E: Worksheet for Estimating Individual Doses

Section 6 provided information about reference diets in the various selected villages along the Alaskan coast. Individuals in these villages who desire a better understanding of their own potential dose may use the following worksheet. To use the worksheet, a person must first total his or her annual input of the various food types. Then, the user must determine which of the RAIG-model water concentrations best fits his or her own location. With these two pieces of information, the user can make a simple calculation to estimate annual dose.

Information is provided so that individuals can estimate their own doses from Russian sources (dumping and riverine releases), from historical fallout, and from natural sources. It is anticipated that assistance from local health care personnel may be required.

Dose Estimation Worksheet

Location Selected ____________________

Time Period Selected ____________________

Amount consumed per year × (Pounds)	**Dose/pound from Table C-1 (Microsievert/pound)**	**= Dose by food type**
Fish ________________	× ____________________	= ________________
Mammals ________________	× ____________________	= ________________
Birds/Eggs ________________	× ____________________	= ________________
Mollusks ________________	× ____________________	= ________________
		Sum = ________________ (Total annual dose, microsieverts)

Step 1: Estimate the total amount of each of the following types of foods, in pounds, that you eat in one year.

Fish (for instance: salmon, herring, cod, char, grayling, sheefish, whitefish)

____________________ lb per year

Marine mammals (for instance: polar bear, seal, walrus, whale, etc.)

____________________ lb per year

Birds and eggs (for instance, meat or eggs from eider, loon, duck, gull, murre)

____________________ lb per year

Marine invertebrates (for instance: crab, shrimp, clams, mussels)

____________________ lb per year

Step 2: Determine which of the three locations applies best to your home; Beaufort Sea, Chukchi Sea, or Bering Sea. If you live near the dividing line between two of these locations, try taking the northernmost one to obtain a higher estimate. You can determine which of these is most appropriate by looking at the map (Figure 6-1 in Section 6).

Step 3: Fill in the worksheet with the number of pounds per year that you eat, and the "dose per pound" value from Table E-1 for the time period and location you are interested in. Multiply each pair of values together, and then add up the total. This is your individual radiation dose estimate in units of μSvs from that source. If you want to know your total dose from all sources, repeat the calculation for natural background and anthropomorphic (man-made fallout) background, and add these results to the result for the former Soviet dumping source.

Note for Table E-1: When numbers are very large or very small, we present them using scientific notation. Scientific notation is a type of shorthand for numbers. For example, we could write the number 1 billion as 1,000,000,000 or using scientific notation, as 1×10^9. To translate from scientific notation to a traditional number, move the decimal point either left or right from the number. For example, if the value given is 2.0×10^3, move the decimal point three numbers (insert zeros if no numbers are given) to the right of its present location. The number would then read 2,000. If the value given is 2.0×10^{-5}, move the decimal point five numbers to the left of its present position (0.00002). As a special case, a number such as 1.3×10^0, when the rule is followed, simply becomes 1.3.

Table E–1. Estimation of individual radiation doses for Alaskan coastal communities located adjacent to the Beaufort, Bering, and Chukchi seas.

Radiation Dose per Pound of Food Eaten, μSv/lb

Source/Food Item	Time Period 1960s	Time Period 1990s	Peak Projected Concentration Beaufort Sea	Peak Projected Concentration Bering Sea	Peak Projected Concentration Chukchi Sea
Kara Sea Instantaneous Release					
Fish	—	—	2.4×10^{-5}	1.0×10^{-5}	1.5×10^{-7}
Mammals	—	—	2.1×10^{-5}	9.5×10^{-6}	1.3×10^{-7}
Birds/Eggs	—	—	5.5×10^{-5}	2.4×10^{-5}	3.5×10^{-7}
Mollusks	—	—	4.7×10^{-4}	1.5×10^{-4}	2.1×10^{-6}
Kara Sea Time-Varying Release					
Fish	—	—	4.8×10^{-7}	2.2×10^{-7}	4.6×10^{-9}
Mammals	—	—	4.6×10^{-7}	2.1×10^{-7}	4.3×10^{-9}
Birds/Eggs	—	—	1.1×10^{-6}	1.4×10^{-5}	1.0×10^{-8}
Mollusks	—	—	7.1×10^{-7}	2.9×10^{-6}	6.0×10^{-9}
Accidental Riverine Sources					
Fish	—	—	2.8×10^{-6}	1.3×10^{-6}	1.8×10^{-8}
Mammals	—	—	1.1×10^{-6}	5.1×10^{-7}	6.8×10^{-9}
Birds/Eggs	—	—	4.6×10^{-5}	2.1×10^{-5}	3.1×10^{-7}
Mollusks	—	—	7.2×10^{-7}	3.3×10^{-7}	4.6×10^{-9}
Chronic Riverine Sources					
Fish	—	—	1.1×10^{-6}	4.8×10^{-7}	1.0×10^{-8}
Mammals	—	—	2.9×10^{-7}	1.3×10^{-7}	2.8×10^{-9}
Birds/Eggs	—	—	2.1×10^{-5}	9.5×10^{-6}	2.0×10^{-7}
Mollusks	—	—	2.6×10^{-7}	1.2×10^{-7}	2.5×10^{-9}
Existing Anthropomorphic Background*					
Fish	9.5×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}
Mammals	9.0×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}	1.3×10^{-3}
Birds/Eggs	1.9×10^{-2}	2.3×10^{-3}	2.3×10^{-3}	2.3×10^{-3}	2.3×10^{-3}
Mollusks	3.7×10^{-2}	4.0×10^{-3}	4.0×10^{-3}	4.0×10^{-3}	4.0×10^{-3}
Natural Background					
Fish	4.9×10^{-1}	4.9×10^{-1}	4.9×10^{-1}	4.9×10^{-1}	4.9×10^{-1}
Mammals	4.2×10^{-1}	4.2×10^{-1}	4.2×10^{-1}	4.2×10^{-1}	4.2×10^{-1}
Birds/Eggs	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}
Mollusks	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}	7.4×10^{0}

* Existing anthropomorphic background (fallout) will continue to decrease in the future with an approximate 30-year half-life. The peak value given corresponds to current conditions.